SUPPLEMENT.

# The Mining Journal,

## RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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### ELECTRO-MAGNETISM AS A MOTIVE-POWER.

highly valuable paper was read before the Society of Arts, on Wed- ay, by Mr. T. ALLAN, upon "Electro-Magnetism as a Motive-Power." two points to solve are its application and economy. Previous appli- ns of electro-magnetism have been at variance either with the laws lectricity or mechanics; it, therefore, only remains to be shown that tricity by an application in conformity with its known laws and pro- ies can be rendered available.

he power of electricity, when applied in the form of an electro-mag is wonderfully great from comparatively small means; but its dy- ic power decreases so rapidly through the intervening space, being versely as some unascertained power of the distance much higher than square," that the range of the maximum effect or valuable portion of dynamic force, with a consequent minimum of consumption, extends small a distance as to be of no real value in mechanics. The great blem to solve has been to contrive such an arrangement of parts as to vert this maximum of the dynamic force, through a range, although vailable in itself, into *stroke*, or such an extent of motion as to be ilable and of practical value as a motive-power.

n the plans and arrangements of these inventions, the maximum por- only of the dynamic force, is applied, and by the mechanical ar- gement of parts, successively and continuously brought into action in irect form, in accordance with the laws of electro-dynamics. When s applied, there is no loss of the primary electric force, and any amount *power*, and any *length* of *stroke*, can be obtained.

The cost of electro-motive power has generally, though erroneously, n considered so great as to render electricity as a motive-power less fitable than steam. But this has arisen from the misapplication of the ctro-magnetic force, not from the necessary consumption of the electric terials, which consumption is inversely as the dynamical ratios of the ce. The introduction of electro-motive power will be an event of great tional importance, tending to alter the value of every article of commerce d manufacture, as steam has done since its adoption.

It is a due consideration of the foregoing summary of a most interest- g and important problem in physical and mechanical science, still pro- essive, that forms the subject of the present paper; and although the al solution is still to be worked out, I will endeavour to detail some of e obstacles, as well as the *modus operandi* entered upon, so far as they ve progressed, to effectuate the same.

Notwithstanding the evident vastness and importance of this subject, d the enlightenment of the present age, it is not a little curious to ob- rve with what stubborn resistance and discouragement any such invention innovation upon vested rights or the routine of bye-gone years is hailed. lectro-motive power, *par excellence*, seems to meet with fully more in- edulity and disbelief in the mind of man now than steam or gas did in eir first days. To mention the subject even seriously is to be considered xt thing to a lunatic, and the signal to have raised against one a bar- er of apparently insurmountable difficulties, the fancies and jealousy of ested interests, the disappointments of various crude and empirical at- mpts, to say nothing of the dogmas of some professors of a sister science. ome such, with minds of but small powers of philosophical conception, e too apt, with unbecoming flippancy, to crumple up a whole question ith a wizard-like *ipse dixit* of impossibilities as to cost, based on anoma- us and untested assumptions.

The cost, however, of such a power is but a subordinate question, as ther and more important points have to be settled first before the cost fairly ascertained. The speculation is thus pushed up to a point where cts are brought to bear upon it, and, fortunately, where facts enough n be adduced to subvert the whole doctrine.

Desiderating cause and effect, and taking a practical survey of the whole ubject, the problem appears to resolve itself more into one of mechanics d mathematics than of chemical equivalents; for, let the cost of a given mount of electricity be what it may, we must see how that is to be eco- omically applied to produce magnetism in the first instance; and, again, ow the dynamic force of magnetic attraction is to be applied to machi- ery in accordance with its known laws, and that, too, to produce such an mount of motion or stroke as will be available to motive machinery.

The power exhibited by electro-magnetism, though very great, extends through so short a space as to be practically useless in mechanics. A powerful magnet might be compared, for sake of illustration, to a steam- ngine with an enormous piston, but with an exceedingly short stroke, *per se*, unquestionably a bad arrangement, or rather no arrangement at ll; yet if such mechanical arrangement could be devised, so as to take dvantage of this enormous piston, and, at the same time, to produce stroke without militating against that power or increasing consumption, then we would have a machine containing the elements of power and motion, without which the question of the cost of producing the electricity, and, still more, its application to produce magnetism, are irrevelant and secondary in the first stages and practical investigations as to producing power and motion in a machine by such agency. It has, consequently, appeared to me that in working out this problem it should be considered in three distinct parts:—

1. How to apply the force of magnetic attraction economically in a machine, taking advantage of its maximum force only with a consequent minimum of consumption, and continuing that power to any length of stroke required.
2. How to establish the right proportions between a given amount of electricity and the length and diameter of a magnet, so as to produce the maximum of magnetic effect with the minimum of electrical consumption.
3. The economical production of electricity and working of the battery.

In the arrangements adopted to utilise these peculiar forces economically, and likewise obtain stroke, it was necessary, to this end, to form magnets with four, six, or eight poles screwed on flat plates, so as to apply the attractive force in a direct form, and thus by the very simple arrangement of a piston-rod passing through the centre of this group of magnets, in a line at right angles to their plane, a keeper resting on a shoulder on the piston-rod would meet the surface of the magnets in a plane parallel to itself; the keeper thus not only embraces the full sphere of magnetic attraction, but, by such an arrangement, as the force of magnetic attraction decreases so rapidly with the distance, it is not economical to utilise or apply more than that portion of the attractive force that is most effective, and so not expend the electricity on that which inversely, as the squares, is comparatively of little value, and only produced with a larger proportionate expenditure.

In this arrangement, when the first magnet in the series has, by attracting the keeper, operated on the piston-rod, the stroke or onward motion of the rod is continued by a similar operation of the second magnet placed below the first, and so on with the third and fourth. The onward motion of the shaft is then continued by a second rod on a second crank in like manner to the first, and so on by a third and fourth.

It will thus be seen that the motion is continuous, not reciprocating, analogous to the overshot water-wheel—each magnet coming into play one after the other—and that it is that portion of the magnetic attraction only which, proportionately to the power obtained, consumes the smallest amount of electricity, and consequently battery consumption, that is applied as a motor in engines constructed on these principles. It will not be difficult to perceive by the foregoing how the great and most important results of the whole problem—viz., the economics—may be completely counteracted by a misapplication of this peculiar dynamic force, whatever it may have cost to produce it; and to illustrate this more clearly, a comparison might be made between the principle of application in the rotary-engine (Jacobi's) and the present arrangements. The rotary engine has hitherto been the most favourite form among the various experimental appliances in electro-magnetism as a motive-power, but in this mode of application, besides a variety of electrical disadvantages, it will be easily seen, having to apply the attractive power in a slanting direction, in place of direct, that there is of necessity a great waste of the magnetic force, that it is the upper portion of the curve only that can be applied effectively, whilst as the magnet has to be demagnetised in time to allow the keeper to pass, the maximum of the force has to be abandoned. On the other hand, in the present arrangements, the application being direct, it is the maximum only that is utilised.

Electro-magnetism is not simply a question of chemical equivalents, or of producing electricity cheap, but more essentially to ascertain the economical application of it to produce magnetism, in the first instance, and then to contrive such an arrangement of parts as will produce stroke or motion in a machine, along with an economical application of that force when so produced. It, therefore, follows that, without a properly combined investigation of these three questions as a whole, and an application of forces in accordance with their known laws, it would be but a waste of time, barren of results, as appears to have been the case hitherto with many expensive experiments made in various countries, disregarding this triplicate application of dynamics in mechanical and physical science.

The introduction, therefore, of electro-motive power, its bearings upon all questions of commerce, manufacture, and civilisation at home and abroad, opens up to the contemplative mind of the political economist a wide field of speculation, and becomes a question of great national importance, tending as it must to further alter the relative value of every article of commerce and manufacture, as steam has done since its introduction. If, then, with electricity we can produce motion and power in a practical and useful form, and so carry forward for the benefit, advancement, and civilisation of mankind that good work so happily commenced by steam, what a grand problem would then be solved.

The unphilosophical manner in which some people allude to electro-motive power superseding steam, is of a nature greatly to predicate against a due consideration of the political economy of such agencies. Common sense, and a proper deference to the philosophy of common things, indicates that electro-motive power will no more supersede steam than steam the water-wheel, as each and all have their own field of operations and functions to fulfil peculiar to themselves; the cost, the power, and the various advantages of either being relative to the requirements of their respective applications as motive forces.

It will suffice to give a brief sketch of some of the many advantages such a motive-power has over steam. A motive-power without fire at once stamps it with peculiarities due to itself alone, and indicates a field of operation in which it can have no competitor. It can thus be applied, where the cost of insurance precludes the use of a steam-engine, such as the hoists in the large Manchester warehouses, where they have not been built on purpose. There are also a variety of other instances where a small engine may be used, as in each flat of a mill, thereby getting rid of all the communicating gearing, the first cost of such gearing, the power to work the same, as also the saving when the mill was working half times, the dinner hour, and in getting up steam. Its application, likewise, as a small power, to house and workshop purposes in town and country, where steam does not venture to intrude as yet, or is entirely disallowed, for various reasons besides fire and the cost of assurance. England, with its cheap fuel, might at first sight appear as the most barren field for its operations; but from it apparent completeness as a small power, it becomes applicable, as an auxiliary agent, in a host of conditions where steam is quite inapplicable; it may be said it has a wide field of operation peculiarly its own; as a small power, there is no reason to suppose that it is inapplicable to larger powers; although it might be rash in its present state of infancy to predicate what its future might be; for, as applied to locomotion, and as an auxiliary screw in our large merchant ships, there is a great point to be gained that is but partially attained by steam. One other value in the applications of such a power is as a species of division of labour, as when it will suit the requirements of the case, instead of being combined into one large engine, as in the steam-engine, it may be applied as several smaller ones, and thus the power be brought close to the work, and not lost in the friction of transmission from a distance.

It would be endless to point out the various conditions where such a power would be applicable; this is best left to the mind of each man, in his own particular sphere of mechanics, and doubtless each will in his own way see a useful application of such a power, when the management of the battery, &c., is reduced to that simplicity that the man of the many can work and manage it as well as the man of the few.

Looking to the political economy of such a question as that of a new motive power, it is not surprising, notwithstanding the scepticism of empirical philosophers, that one should become an enthusiast in such a cause, feeling that the obstructions thrown in one's way are mere blocks of granitic ignorance, to be hewn and removed aside by patience, perseverance, and investigation into the nature of things.

The new-born science, though still but little known, is gaining on us fast, and advancing with rapid strides into the business of every-day life.

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PRODUCTION OF CAST-STEEL.—Mr. Gardiner, mechanical engineer, of New York, has obtained a patent (2234) for "a new and useful process in the treatment of cast-steel while passing from the molten state into that of being hardened or tempered, and which, with certain variations, is applicable to the making of tools, instruments, axes, wheels, or ingots." This invention consists in casting the steel in refractory moulds made of fire-clay, black-lead, &c., that will not adhere to the melted metal, and heated to bright redness; then, placing the moulds containing the liquid metal in a close oven, where the temperature is maintained for several hours, and where it may solidify and cool down very gradually, out of contact with air or flame, to a cherry red, at which point the castings are removed from the moulds and immersed in olive or whale oil, heated to 600° or 700° Fah. When the castings are more than an inch thick, the temperature of the oil must be maintained for several hours, and then allowed to cool gradually. By this treatment very great toughness, softness, and ductility is imparted to the steel. For obtaining hardened castings they are treated in the same way, but immersed in a liquid at a temperature of from 100° to 150° Fah., according to the temper required.

### GEOLOGY OF THE AUSTRALIAN GOLD FIELDS.

[The following interesting communications were read at the Geological Society of London, and will be published in their "Transactions"—for an early proof of which we are indebted to the Secretary.]

1. "On the Geology of the Gold Fields of Victoria." By A. R. C. Selwyn, Geologist to the Colony of Victoria. (In a letter to Prof. Ramsay, F.G.S.)

The author stated, that in the colony of Victoria, from a line east of Melbourne to some distance west of that place, he has traced a succession of fossiliferous palæozoic rocks, commencing with schists, much cleaved and contorted, and containing lingulæ and graptolites, passing through a series of schists and sandstones, with trilobites and many other fossils characteristic of the lower, middle, and upper Silurian series of Britain, and terminating with Devonian and carboniferous rocks; and he remarks that the younger or oolitic (?) coal-bearing beds on the west rest unconformably on the palæozoic rocks. A list of about 60 genera of Silurian fossils, including many new species, was appended.

The gold-bearing quartz veins of the Silurian rocks appear to the author to be dependent more on their proximity to some granitic or other plutonic mass than on the age of the rocks in which they occur. Quartz veins do not appear to traverse the oolitic (?) coal rocks, which are of newer date than the granites of this district.

The author's observations refer chiefly to Bendigo, Ballarat, and Steiglitz gold fields, where graptolites and lingulæ occur in the schists, which are traversed by the gold quartz veins. The granites here do not contain gold; and, though they have altered the slate rocks at the line of junction, yet they do not appear to have affected their general strike or dip, but appear to have themselves partaken of the movements which have placed these Silurian rocks on their present highly inclined and contorted positions, and given them their very uniform meridional direction.

Mr. Selwyn recognises gold-bearing drifts of three distinct ages. The lowest contains large quantities of wood, seed-vessels, &c., at the various depths, to 280 feet, and is associated with clays, sands, and pebbles. These are overlaid by sheets of lava. A more recent auriferous drift, containing also bones of both extinct and living marsupial quadrupeds, overlies these lavas in some places; in others it rests on the older drifts; and at Tower Hill, near Warnambool, marine or estuary beds of probably the same age are overlaid by volcanic ashes. A third, and still more recent, gold drift is found on the surface, overlying indifferently any of the older deposits.

The gold is found at the base of these drifts or gravels, which are the result of the immediate waste, by atmospheric and fluviatile action, of older masses, and have not been far transported. The largest amount of gold is found in the drifts when near the Silurian schists. The author believes that there is every probability of gold deposits existing under the greater portion of the lava plains of the region to the west.

Mr. Selwyn also described a cave in which he had discovered in the basaltic lava of Mount Macedon, a few miles north of Melbourne, and in which he had found bones of many living species of mammals, including the "devil" of Tasmania, and the Dingo or native dog. The cave is about 1000 feet above the sea level, and thirty miles inland.

2. "Notes on the Gold Field of Ballarat, Victoria." By John Phillips, C.E., Surveyor in the Government Service of Victoria. (Communicated by Sir R. I. Murchison, V.P.G.S.)

All the Victorian gold fields are near granite, and some are on it. The granite at Ballarat is fine and even grained, and the schists lie against it. Between these rocks the junction is abrupt; there is little or no gneiss, and no porphyritic or other veins were observed. The schists are greenish, and are occasionally chloritic, micaceous, aluminous, and siliceous, and are traversed by quartz veins from less than an inch to one foot in thickness. The schists in the upper portion are more quartzose, and contain oxides of iron; lower down they are more aluminous, and contain pyrites. Their strike is rather uniform; nearly coinciding with the true meridian, while the cleavage and quartz veins are not regular in strike. The workings at Ballarat have exhibited a section of 300 feet in thickness, consisting of gravels, sands, clays, and trap-rocks. The oldest drift or gravel—a beach-like conglomerate—is found not in the deep section, but on the surface of the schist country. It is regarded as of marine origin by the author, and is composed of quartz, and contains gold at its base. Another drift has been deposited in gullies cut through the oldest drift and deep into the schists. This also is auriferous, and is covered by an ancient humus, which, in the deep section, is found to contain stems of trees, and to be covered over by a trap-rock enclosing upright trees. This fossil wood is usually but little altered in its texture and ligneous qualities; its colour is changed from that of red birch to cocoa or lignum-vitæ. But some of it has passed into jet; and both the charred and the uncharred woods have much bright pyrites in them. The flora of this old land-surface resembles that of the present day.

This first trap is covered by green and brownish clay and sand, which are succeeded by another trap, having a line of charred vegetable matter at its base, and also having a similar covering of clay and sand. These clay and sand deposits are regarded by the author as being of lacustrine origin; the volcanic rocks having dammed up the old river courses that formed the gully-drifts, and caused the drainage water of the region to be accumulated in lakes.

The next deposit is a coarse ochreous quartzose drift, considered by the author to be the effect of some sweeping deluge; and this is also overlaid by a third bed of trap-rock, with the charred remains of a forest intervening. This trap is covered by a mottled clay of pure quality, also regarded as lacustrine.

A fourth trap succeeds, covered by a superficial quartzose drift (of diluvial origin, according to the author), and lying on one side of the schistose hills, which are clearly denuded on the other.

In the basin of the Yarrowee, which is covered chiefly with this gravel, the author traces the run of the "gold leads" or old gullies, which have only an approximate resemblance to the ramifications of the present river. These ancient gullies or leads had a very uniform fall, which, from the smallness of the contents of the gullies, must have been as rapid as 16 in 1000, while the present Yarrowee has only a fall of 5 in 1000.

Mr. Phillips urges that all the basin between the gold leads may be wrought by the aid of the water-power of the Yarrowee; a thousand horse-power being now allowed to run waste, which, by means of reservoirs, could be made available.

The author adds that silver nuggets have been reported on good authority to have been found within 30 miles of Ballarat. He further observes that, whilst surveying the district, oscillations of the spirit-bubble indicated a rocking of the earth; and that the country in places sounds hollow, like a wooden bridge, horses even noticing it in passing.

3. "Notes on the Gold Diggings at Creswick Creek and Ballarat." By W. Redaway. (Communicated by Sir R. I. Murchison, V.P.G.S.)

Mr. Redaway noticed first the "bluestone" or concretionary basaltic lava at Creswick Creek, which composes also the rough bouldered surface of the country to a great extent. In the plains formed of this volcanic rock small lakes or water holes, from 3 to 12 feet in diameter, are in some places frequent.

At Creswick Creek, the different diggings perforate varying thicknesses of the bluestone, from 17 to 20 feet. Under this is 30 feet of solid clay; then, darkish-coloured quartzose gravel, with abundant remains of wood, to a depth of about 80 feet; and under this the "gutters," "leads," or "runs" of auriferous quartzose gravel, or "wash-dirt," are met with on the surface of the slate, or on pipe-clay. The pits vary considerably in the sections they afford.

The fragments of wood in the gravel are of all sizes, from tree-trunks, 3 or 4 feet in diameter, to branches and twigs; and this drift is throughout impregnated with woody particles, giving it a black appearance, especially towards the bottom. The cones of the "honeysuckle," or banksia, have been found not unfrequently in this drift. These are very brittle, but the wood is often well preserved. Thin horizontal layers of very hard rock are imbedded in the gravel.

Some of the "gutters," or "leads," were traced by the author on plans showing their course beneath this drift across the present gullies, and from hill to hill; especially the "Black Lead" and the "White Lead," underlying Little Hill, one of them having a branch from under Clarke's Hill, and both uniting before passing under Slaughter Yard Hill.

At Ballarat, Mr. Redaway observed, in a pit on Sevastopol Hill, two layers of bluestone (the second bed about 80 feet thick) above the gold drift or "wash-dirt," together with stiff clays and quartzose gravels. Here the author traced some gold runs—the "Frenchman's Lead," "White Horse Lead," and "Terrible Lead," running parallel to each other in a direction transverse to that of the present gully, and from hill to hill. Like all other "leads," these rise generally in the neighbourhood of a quartz vein (or "quartz reef") in the schist, 2 or 3 feet in depth, and gradually get deeper.

4. "On the Gold Diggings at Ballarat." By H. Rosales. (In a letter to W. W. Smyth, Esq., Sec. G.S.)

By the aid of machinery, and through the alteration of the mining regulations granting extended claims, the old ground has been profitably reworked; and, by the introduction of the frontage system, which, according to the difficulties to be overcome, grants extensive claims on new ground, the present "leads," most of which are from north-west of the gravel pits, under the township, &c., are advantageously worked. The amalgamation of three or more claims is also allowed, the miners having then to put down only one shaft.

The engines most in use are stationary, of from 15 to 30 horse-power, with winding and reversing gear. To the end of the winding-gear shaft is attached the crank for

the pump, and the motion is also taken to drive a puddling machine, which is nothing but the arrastra working without mercury. The depth of sinking averages about 300 ft., of which, in some instances, there are as much as 200 of basalt to be cut through. At the junctions of the Frenchman's and White Horse Leads, in the Eldorado, the remains of a tree were found in an undisturbed position, with the roots fast in the wash-dirt; and it may be interesting to you to know that at Poverty Point the deep channel, with a north-west strike, is crossed at about 140 feet higher by the shallow channel, which has a strike of north-east by east, and which again, in its turn, is crossed, at a level of 20 or 30 feet still higher, by the present water-course, the strike of which is west.

5. "Notes on some Outline Drawings and Photographs of the Skull of Zygomaturus trilobus, Macleay, from Australia." (By Professor Owen, F.R.S., F.G.S.)

## GEOLOGY AND MINING.—No. IV.

The leading doctrines of modern geology are very few and simple. All the stratified rocks which we observe at or near the surface of the earth, and they compose the greater part of it, were originally formed at the bottoms of seas or lakes, mechanically deposited as mud or sand, or chemically precipitated in various forms. These deposits were always laid down in beds more or less approaching to horizontality, and they have since been uplifted from the depths where they were first formed into the undulating plains and contorted mountains by which the surface of the earth is now varied. Mind, the land was raised, not the sea lowered; for nothing is better established than that during all geological time, cognisable to our examination, the level of the ocean has changed little, if at all.

These stratified rocks have been ruptured and penetrated throughout their whole series by various rocks of igneous origin: by volcanic or trap rocks, which were forced up through, or near to, the surface either on the land or under water; or by granitic rocks, which, although originally consolidated deep in the earth's bosom, were subsequently elevated, and their covering removed by the effects of denudation acting through countless ages.

These two classes of rocks would at all times be readily distinguishable from each other, if we did not frequently find another class, partaking alike of the character of each of the others, and forming that transition between them which we find everywhere in nature. There are rocks to which geologists have agreed to give the name *metamorphic*, they having been produced by a metamorphism, or *alteration*, of the sedimentary strata by various causes—principally, it is supposed, those of heat and pressure.

I shall refer to some of the leading features in these rocks, in order that I may dwell more particularly on the causes to which their alteration is due, as it appears to me that it is to these causes we must almost entirely attribute the phenomena bearing on mineral veins.

METAMORPHIC ACTION.—Scarcely one rock mass throughout the whole range of geology can come under examination without our finding some kind of structure which, on careful consideration, we must see could not have existed at the time of its original formation. When chalk was first deposited it is quite evident that it did not contain the flints with which some parts of it now abound. The aggregations of carbonate of iron which are found so plentifully in many rocks have, undoubtedly, been accumulated since the formation of those rocks. The older clay-slates were clearly not deposited originally at the bottom of the sea in the hard, compact form in which we now see them. The extensive veins of quartz, carbonate of lime, carbonate of magnesia, which we find in rocks of various classes, are long subsequent in formation to those rocks themselves. Again, we can find no rock mass that is not more or less divided by a regular or parallel structure, extending in many cases to a structure called cleavage, by which we mean a tendency in rocks to split into thin parallel plates, in a given direction, extending over wide areas, independently of their stratified lamination. Both joints and cleavage are palpably due to some action that has taken place since the consolidation of the rocks affected by them.

All these peculiarities of contents and structure we know, on the slightest consideration, must have been produced in rocks since their formation. But there is another class of rocks, the metamorphic origin of which is not at first sight so evident, but which we can yet prove, by direct observation, to have had that origin. This class includes many of the so-called primary rocks, which the old geologists supposed to have been precipitated in the crystalline state in which we now find them. It is one of the greatest steps of modern geology to have proved that these rocks were deposited originally in the form of sand, mud, or chalk, just as such substances are now deposited under water, and to have been since metamorphised, or altered, to their present condition by various causes. This is the case with most of the gneiss and mica schist rocks, quartz rocks, and primary limestones which have been distinctly proved to be merely the altered form of common schistose, quartzose, and calcareous beds. I extract a short passage from Sir R. Murchison's *Siluria* respecting these rocks, and the proofs of their alteration:—

"We now know that a great portion of the micaceous schists, chloritic and quartzose rocks, clay-slates, and limestones, once called primary, were of later origin. Many of these are nothing more than subaqueous sediments of various epochs, which have been altered and crystallised at periods long subsequent to their accumulation. This inference has been deduced from positive observation. Rocks, for example, have been tracked from the districts where they are crystalline to spots where the mechanical and subaqueous origin of the beds is obvious, and from the latter to localities where the same strata are wholly unchanged, and contain organic remains. Transitions are thus seen from compact quartz rock, in which the grains of silica are scarcely discoverable with a powerful lens, to strata in which the sandy, gritty, and pebbly particles bespeak clearly that the whole range was originally accumulated under water. Other passages occur from crystalline, chloritic, and micaceous schists to those clay-slates which are little more than consolidated mud, and from crystalline marble to common earthy limestone, in which organic remains abound."

The term "metamorphism" was originally applied only to the latter class of rocks referred to—that is, those in which the process of alteration has been carried so far as to obliterate the original structure; but lately the meaning of the word has been more extended, and it is now used to indicate all alteration, however trifling, and from whatever causes, that has taken place in rocks from the time of their first accumulation. In using the word metamorphism, however, in this large sense, we must remember that the term *metamorphic rock* is still limited to its original significance—that is, to works where the action of metamorphism has been carried so far as to obliterate the original structure, and give rise to a new one.

The causes to which this metamorphic action is due are among the most complicated questions in the whole range of geology, and particularly when we use the word metamorphism in the wide sense I have done; for it is quite evident that the causes which have resulted in the alteration of schist into gneiss, and chalk into crystalline statuary marble, which have produced the joints and cleavage of rocks, which have given rise to the aggregation of flints, ironstone, and septaria, and to which we owe the great veins of calcareous and quartzose matter with which extensive masses of rocks are penetrated, are manifold and complicated cases, and require the most minute and careful investigation.

This examination they have yet far from received, but, as far as our knowledge goes, the following are now held to be the principal causes of alteration in rock masses:—

1. Heat, either simply or as producing chemical and electric action.
2. Heat and moisture, either simply or as producing chemical and elec- [tric action.
3. Compression.
4. The continued percolation of water through the whole surface of the earth. No point of the surface within the reach of man can be penetrated, and no rock, however compact, can be broken which will not be found to contain water holding some other substances in solution—often silicic or carbonic acids. It is, now, fast being recognised that it is to this never-ceasing passage of water through the crust of our globe that the principal minor effects of metamorphism are due, such as the formation of quartz veins, &c.—HEINRICH BERGMANN.

CHEMICAL CHARACTERISTICS OF GOLD.—It is found by experiment that gold is not easily acted upon by acidulous agents, still there are two definite oxides of it. When gold is fed into a vessel containing aqua regia (nitro-muriatic acid), which contains free chlorine in the nascent state, it is dissolved, and a per-chloride of gold formed, which is a red, deliquescent, crystalline compound, soluble in water, ether, and alcohol, and is decomposed by light and heat. When proto-chloride of tin is added to a solution of per-chloride of gold, a fine purple precipitate is formed, which is used in porcelain painting, and for tinging glass a red colour. Gold dissolved in nitro-muriatic acid can be precipitated by adding to it a solution of the proto-sulphate of iron; the gold subsides to the bottom of the vessel containing the solution, and forms a brown powder, which, after being washed in hot water, then digested in hot dilute muriatic acid, is again washed, and forms the pure gold employed in gilding china or porcelain ware. Silver and copper are harder than gold; hence, mixed with these metals, it produces an alloy harder than itself. The gold employed in jewellery is much adulterated, the skilful jeweller easily giving different shades of colour to golden ornaments by exposing them to different chemical agents, which dissolve a portion of the copper and silver alloy, while they do not touch the gold. A solution of gold in ether applied to the surface of fine polished steel instruments gilds them, the ether being driven off with heat.—*New York Times*



## GREAT WHEAL BUSY UNITED MINING COMPANY.

The quarterly general meeting of adventurers in this company was held on the mine, on Friday, March 19,—Mr. ROBERT HART PIKE in the chair.

The CHAIRMAN stated he was pleased to see so large an attendance, and as they had a considerable amount of business to go through, he trusted they would give that attention which the affairs of so large an undertaking required.

Mr. BAWDEN read the notice convening the meeting, and the minutes of the last, which were confirmed.

The financial statement was then read, as follows:—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Balance last audit | £3414 | 5 | 1 | | | | |
| November labour cost | 1802 | 7 | 10 | | | | |
| Merchants' bills | 2639 | 4 | 8 | | | | |
| December labour cost | 1544 | 5 | 10 | | | | |
| Merchants' bills | 1458 | 5 | 3 | | | | |
| January labour cost | 1619 | 13 | 7 | | | | |
| Merchants' bills | 1483 | 0 | 2 | | | | |
| Lord's dues | 114 | 15 | 1 | = | £11,273 | 9 | 3 |
| Call, Dec. 21, 1857 | £5000 | 0 | 0 | | | | |
| Sales of tin, 17 tons 5 cwts. 2 qrs. 20 lbs. | 977 | 6 | 11 | | | | |
| Sales of copper, 623 tons 9 cwts. | 1750 | 13 | 5 | | | | |
| Arsenic | 26 | 5 | 0 | = | 5,754 | 5 | 4 |
| Balance | | | | | £5,519 | 3 | 11 |
| LIABILITIES. | | | | | | | |
| Merchants' bills | £6040 | 13 | 4 | | | | |
| Lord's dues | 114 | 15 | 1 | = | £ 6,155 | 10 | 5 |
| ASSETS. | | | | | | | |
| Balance at bankers—Lubbuck and Co. | £ 120 | 16 | 2 | | | | |
| " —Williams and Co. | 176 | 10 | 5 | | | | |
| Arrear of call | 120 | 10 | 0 | | | | |
| Merchants' balances | 218 | 9 | 11 | = | 636 | 6 | 6 |
| Balance against the mine | | | | | £ 5,519 | 3 | 11 |

The CHAIRMAN stated that Mr. King (the secretary) was present, and would give any explanation that might be required.

Mr. STEPHENS said he had seen one or two statements in the *Mining Journal*, and having heard privately that several accounts had been kept back, and judging from the large balance now against the mine, he could only conclude such was the case: he would ask if every bill was now charged?

Mr. KING said the clerk at the mine had charged up every account to the end of January, and the balance-sheet was worked up to the end of that month. Captain Pascoe would probably explain why the merchants' bills were so heavy.

Capt. PASCOE, in reply, said the new crushing engine had been had and charged during the quarter, and several other pieces of machinery had been delivered and charged, but he was glad to say in future we might look for a great reduction of expenditure under this head.—The accounts were then unanimously adopted.

The CHAIRMAN said, the next business was that of discharging the balance of 5519*l.* 3*s.* 11*d.* (which he certainly was not prepared to see), and to make a call for the future operations. To divide the back cost would be about 18*s.* 4*d.* per share, and he recommended that sum, with a further call of 11*s.* 8*d.*, making together 30*s.* per share, and to be paid forthwith.

A warm discussion ensued on the amount of call, and an amendment was moved that a call of 20*s.* per share be now made.

A SHAREHOLDER said it would be better for Captain Pascoe to give his report, and an estimate for the ensuing quarter; they would then be able to judge what call would be required.

Capt. PASCOE read his report and estimate, which showed, from the large quantity of tin and copper he would sample during the quarter, that the latter call would be ample, and that the mine from this date would be approaching profits.

Mr. KING regretted to state he had no confidence in the estimate now given, for at the last meeting, finding the debt against the mine to be 2300*l.* he, in company with Mr. Fielding, visited the mine to examine it. At Capt. Pascoe's house they went into the financial affairs of the company, and he requested him to go carefully into the question as to what further calls would be required to bring this property into a paying state, when he gave the following statement of six months' costs and returns:—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| COSTS—Nov. Labour costs and bills | £2000 | 0 | 0 | | | | |
| Dec. ditto ditto | 1800 | 0 | 0 | | | | |
| Jan. ditto ditto | 1800 | 0 | 0 | | | | |
| Feb., March, and April ditto | 5400 | 0 | 0 | = | £11,000 | 0 | 0 |
| RETURNS—Balance of call after paying back costs | £ 700 | 0 | 0 | | | | |
| Nov. and Dec. ore | 2000 | 0 | 0 | | | | |
| Jan. and Feb. ditto | 2400 | 0 | 0 | | | | |
| March and April ditto | 2400 | 0 | 0 | | | | |
| Six months' tin, 10 tons per month, at 50*l.* | 3000 | 0 | 0 | = | 10,500 | 0 | 0 |
| Balance required | | | | | £ 500 | 0 | 0 |

Mr. KING continued: They would see from this statement that six months' working showed a balance of only 500*l.* against the mine; and at the meeting in December a call of 3000*l.* was made; and now, at the end of three months, they found a debt of 5519*l.* 3*s.* 11*d.* against the mine, with one month's sale of ore in hand. In fact, the utter discrepancy between Captain Pascoe's reports and estimate and the results caused the committee to call in two independent agents, and likewise one of the local adventurers to send Captain Bryant; therefore, they having heard Capt. Pascoe's statement, he would call on Capts. Nancarrow, Delbridge, and Bryant, to give their reports, and see if they agreed with what they had heard.

The CHAIRMAN then put the amendment, which was lost; and the resolution was carried for making a call of 30*s.* per share.

Mr. SIMS, the engineer, stated that he had examined the whole of the machinery, and, except the boilers, he was glad to say it was in first-rate condition. It was well known the water at this mine was exceedingly bad, being strongly impregnated with sulphuric acid, and which was now beginning to show itself in the boilers of the large pumping-engine, and unless more water was procured he would not answer for the result; one or two sources were available, but though he had brought this matter before the manager some time back nothing was done. By order of the committee the matter was in hand, and his estimate for doing the work required would be from 600*l.* to 800*l.*, and which he advised being at once done.

The following reports were then read:—

*March* 15.—By your request I have inspected this mine. I find the 40 extended west of King's shaft 83 fms.; for a great length the lode is standing in this level, and not cut through, consequently I cannot report its value. The ground is favourable for driving. Some fathoms west of the end you have a slide which will intersect the lode; to the west of this slide, in the shoal levels, as deep as the ground was wrought by the former workers, some rich copper ore was raised, which sold for 12*l.* to 15*l.* per ton.; according to my opinion this level should be extended west to prove the value of the lode west of the said slide; still, in the back of this level a quantity of ground will be taken away at 12*s.* to 13*s.* 4*d.* tribute; in this level near the end I would recommend cross-cutting through the lode to prove its value. In the 50, west of King's, the lode is from 3 ft. to 5 ft. wide; in the end of this the lode yields some very good copper ore; this level is extended west of King's 20 fms.: 8 fms. east of the end the lode was intersected by a slide, which seems to be the slide above named; since the slide has passed through the lode the lode seems to be changed from capel to a great quartz lode—yielding good stones of copper ore. This end should be driven south through the lode, after being cut through should be extended west under Black Dog, being 44 fms. apart. I have a good opinion of this piece of ground; as the lode is changed west of the slide you are likely to have a better quality ore. In the 60, west of King's, 5 fms. behind the end, the lode is 9 ft. wide, yielding tin of low quality. I recommend cross-cutting in the end to go through the lode, also pushing on this level west to get west of the slide, as you may expect a change in the lode. In the 70, west of King's, in the end of this level, the lode seems to be going to the north; about this point a large lode is working on, and yielding quantities of low quality tinstuff, stoping on tutwork, but, from present appearances, is not likely to pay on tutwork; this I would recommend to be worked on tribute, and keep all the stuff on the stull that would pay for returning; this the ground seems to be approaching an elvan course, which, below, is more likely to yield copper; this level should be driven with all dispatch, as you may expect to meet with a run of orey ground, as the level above yielded a quantity of low-priced copper ore. King's shaft is sunk as deep as the 80; at present this shaft is full of stuff I recommend this being cleared up, and to drive the 80 west of the same. It is said the 80 is driven 20 to 30 fms. In 15 to 20 fms. driving you may expect to intersect the elvan course now in the 70, where you have the tin ground; but below the 80 I expect you will again have a copper lode more valuable, as I think the ore will ride on the elvan hereafter; 10 or 15 fms. west of King's shaft (70) I recommend cross-cutting south through the lode at once, as half way up towards the 60 a lode is now being worked upon, yielding 4 to 5 tons of ore per fm.; this appears to be 6 ft. to 8 ft. apart from the tin lode, which part was discovered by tribute workings. I have, by observations of the character of the lode I find it improves in appearance and value from the 10 towards the bottom of King's, so much so that I am of opinion this part of the mine will be a productive lode in depth.

*March* 16.—Fielding's shaft is sunk as deep as the 90, and 6 fms. to the west of this shaft in the 90 a large lode of tinstuff is being stoped, and from present appearances the copper part is standing to the north, this is whole to the 80; from this piece of ground you may expect a large amount of copper and tin; when this stope is completed for railroad I would advise cross-cutting to prove the south ground. In the 95, west of the engine shaft, the lode is 2½ to 3 ft. wide, yielding 2½ to 3 tons of ore per fm.; the end is within 3 to 4 fms. of Fielding's shaft, to communicate which drive west at once, also sink Fielding's shaft, and effect the communication with all speed; then you can clear up the engine shaft and fork to the 100; during this drainage you may sink Fielding's towards the 100 in dry ground. In the 95 east a cross-cut is driving north to cut the north part of the lode, in that part on which Chyanoweth's bottom is sunk; at this point you may expect to have 2 to 3 fms. to drive, which will unwater these workings, but until this cross-cut is driven and the lode cut I should not attempt to do anything in this bottom. I recommend cross-cutting the lode exactly under Offord's shaft, which is only 8 to 10 fms. west of Chyanoweth's bottoms, and to cut the lode at this point, this will drain the bottoms at once, then sink Offord's shaft to the 90, drive the 90 east under the ore ground, and take the ore away dry; but if you drain the bottoms by a lift you will have to cross-cut and sink the shaft; by the time that this is completed the bottoms will be sunk or stoped to the 90, and most likely the ore taken away at a great expense; whilst, otherwise, it might work to profit—this I condemn. In the 95, east of the engine-shaft, on south lode, the lode 2 ft. to 3 ft. wide; the lode has a kindly appearance, and is likely to yield a large amount of tinstuff, and seems to be the part of the lode that was cut by Offord's shaft, which appears to be stoped as deep as the 100. Time is required to open this part of the mine, as you have no shaft within 10 or 12 fathoms of these workings. The 80 fathom level is extended 60 to 80 fathoms from Offord's shaft; in this level you have discovered a large quantity of tin and tin, and having two or three intersections of other lodes still in the south and this you may expect large deposits of ore in this part of the mine; on the back of this level a great quantity seems to be taken away about the point of intersection. In the 80 end the lode is very large, not cut through, but the whole length yielding ore and tin of low produce; in the back and bottom of this level thousands of tons of ore still remain to be taken away at high tributes; and 3 or 4 fms. to the north of this level you have a lode standing in whole ground, and as soon as the tramroad is in it should be cross-cut into, to prove its value. To prove this ground about the 80, in the east part of the mine, you require a shaft to be brought down from the surface, by so doing you would lay open the whole of the ground from Offord's shaft, east of any of the present workings. You have not shafts enough open in the east part of the mine to dispatch the stuff, but if the east ground is opened by a good shaft, and the ground be cut through by cross-cuts and proved by winzes, you might depend upon thousands of tons of ore from ground that will not work otherwise; this is one of the most important objects now for your consideration. Again, in the 30, 60, and 90 cross-cuts the lode north and south, and this only this is likely to discover new shoots of ore, and to open into side lodes. Time is required to complete this shaft as deep as the 90, but, no doubt, on sinking on the lode you may discover some rich bunches of ore. Being parallel with a great elvan course, I am of opinion that this shaft will open up some good shoal ground, and ore of good quality.

*March* 17.—Penniger's shaft is sunk as deep as the 80, and from the 50 to the 80 on the course of the lode; from the 50 to the 80 you have thousands of fathoms of tribute ground on the different lodes, which will be taken away on high tribute. From Penniger's shaft east about 40 fms. this level is in whole ground (about this point 40 fms.) Moyle's bottom is worked in the bottom of this level, nearly as deep as the 90, in a very large lode; the lode is now yielding 8 tons of ore per fm.; in the 90 below these bottoms and stopes I would advise you to cross-cut north through the north ore ground, which appears to be in whole ground from the 90 to the 80; in this piece of ground you may expect thousands of tons of ore; also south may be expected a large amount of property. Notice, ere this shaft (Penniger's) is sunk to the 90, the stuff from this working will be discharged to Fielding's. A railroad is now about to be put in from Moyle's bottoms west to Penniger's shaft; the lode is in whole, which from the 80 fm. level will be in orey ground; by sinking Penniger's shaft will lay open a quantity of tribute ground on the north and south lodes. About Penniger's shaft, and west 20 to 60 fms., the lode seems changed, the ore yields a better produce, and good bunches of tin ground are in this part of the mine; the lode is very wide, and likely to open a quantity of tribute ground. To work this part of the mine properly, extend the levels west towards King's with all speed, communicate this piece of ground from Penniger's to King's in the 90, and then look out for a paying mine. In the 80, west of Penniger's, on the south lode, the level is extended west of the said shaft 50 or 60 fms.; from the end half way back to the shaft the lode has yielded some very rich ore, from 10 to 12 per cent. produce; the lode in the end is 2 ft. wide, yielding a little ore of good quality; I would recommend driving this end west with all speed, as it appears that this lode is standing in whole ground for the whole length of the mine below and above to surface; this seems to be an important piece of ore ground. The pitches working in the back of this level are looking well. In the 80, west of Penniger's, on north and south great lodes, the lodes are large and orey; at this point but little has been done; this should be extended west under King's, as with King's and Penniger's there is no communication, although King's is in the 80. At this part of the mine you may expect to do some good ere the east part will be in a proper state of working. I beg to remark, having taken observation of all the levels in the mine, you have a large amount of property before you, so much so that I think no man can give an estimate of it to within 30,000*l.* True, the ore is of low quality, but looking on the tens of thousands of fathoms of ground, yielding 2, 3, 5, 6, and some 10 tons per fathom, for the length and depth of this mine, you may say it is inexhaustible; true, the parallel lodes and the many intersections which are likely to improve your property, are favourable indications of Great Wheal Busy making a lasting and profitable mine. In closing my remarks, I beg to recommend to your consideration two streams of water, which can be lifted from the adit to supply the boilers throughout the mine, without the water from Wheal Daniell; from the quantity now running through the adit it will require a pole to lift it; if this stream continues you need no other; but if only half the stream continues you may over work, and get a good supply; this can be drawn by the stamping-engine, and conducted to the pumping-engine at once, thence to the steam-whim and stamps.—J. DELBRIDGE.

*March* 17.—The engine-shaft is clear to the 98 fm. level, having, as is supposed, 3 or 4 fms. more to clear; it is small, but a good firm shaft. The pitwork is good, and seems well fixed. The drawing-shaft for this is Fielding's shaft, which is 8 fms. to the west, and sunk to the 90 fm. level. The next shaft westward is Rawlings's, sunk to the 90, but only clear to the 70. Boarding's and Poole's shafts are to the south of this; then Penninger's, sunk to the 80; next King's, sunk to the 80, but only clear to the 70; then Davis's, sunk to the 50. East of the sump is Offord's shaft, sunk to the 90; and still further east is Pistlehorne shaft, sunk to the 70, but not cleared.

LEVELS.—There is no level driven in the mine, though the ends are orey, especially in the lower levels, and a large and very promising lode in most of them, but as no ground has been driven in either of them for this working their exact value is not so easily ascertained.

TRIBUTE DEPARTMENT.—Large quantities of ground are laid open on the main lode, of which a considerable portion is ore ground. An elvan course or lode close on the main lode to the north is opened on, and wrought extensively in several places, and promises fair; on this four pitches are working at Offord's by sixteen men, at an average tribute of 9*s.* 6*d.*; and four at Fielding's and Poole's, at an average tribute of 12*s.* in 1*l.* Winter's lode is still to the north, and close on the elvan, where there are three pitches working in the 20, at 12*s.* in 1*l.*, and likely to be wrought to advantage. On the south lode, west of Penniger's, in the back of the 80, four pitches are now being worked, at an average tribute of 9*s.* 4*d.*; the lode is producing about 1 ton, or 8*l.* worth of ore per fm.; this lode is not seen above the 70, but well deserves being opened on. Besides the pitches already mentioned, 49 are being worked on the main lode, making in all 64 pitches, worked by 198 men, at an average tribute of 10*s.* 10*d.* (the men pay for neither drawing or dressing), which seems little enough as an average, for some of the pitches worked are very poor. The best ore ground appears to be in the back of the 80, east of Offord's, in the back of the 40, west of King's, and in the elvan about Offord's shaft in the 62. From these and other places large quantities of ore may be raised, but the heart of the best bunches or courses of ore discovered is already taken away, and the ground now worked being, to a considerable extent, the gleanings; the ore raised is, consequently, of inferior quality; but ground should be opened, when new courses of ore, and of better quality, would doubtless be met with. There is tin mixed with the copper in many of the pitches, and some are exclusively on tin, the best of which are in the 90, east of the sump, but the tribute averages nearly the same as the copper.

TUTWORK.—For the effectual working of the mines, I recommend the following work being done:—The 50 fm. level should be driven west of Davis's under the ore ground gone down in Black Dog. The 70 should be driven west of King's, or first sink a winze down through the tin ground behind the end; these stopes are now poor. The 80 should be driven west of Penniger's on the south lode. The 90 to be cleared west of Rawlings's, the men first to clear the shaft. Penniger's shaft to be sunk as soon as drained by the 90. Fielding's shaft to be sunk below the 90. The 98 west to be driven from engine-shaft under Fielding's The 98 east to be driven under Chyanoweth's bottoms, of which it is within 6 fms., and where a very good lode is said to be gone down. The engine and Offord's shafts should be cleared up and sunk, and some of the east ends driven as soon as practicable, especially the 98 and 90. Pistlehorne shaft should be cleared up and repaired, for the purpose of working the eastern ground, and cross-cuts be put through the lode in several places. Nearly all this work should be commenced at once.

Great alteration must be made in the dressing department. I should recommend the placing of two competent persons—the one over the tin dressing department, to assay all the samples, and take charge of the stamps and pair, and the other to take the entire charge of the copper dressing, each to keep a proper account of all work done in his department. I think 5 tons of tin and 300 tons of copper ore per month may be calculated on, and as all the tutwork proposed would be on the lode, and in many places in ore ground, the quantity would probably increase. I regard this as a splendid mining property, and one of great value, but it requires a further outlay to become remunerative. The underground water here is very bad, and the filtering process seems to make it worse, by extracting the sediment which would tend to stop the cracks or fissures in the boilers, thereby leaving the acids greater power to act. It is best as it comes from the condensing cistern, but bad at best, and I think the getting of Wheal Daniell water, which is very good, would well repay the outlay. To this I would direct the serious attention of the committee. The getting Wheal Daniell water would probably prevent the necessity of having a new revolving lift at the stamps.—J. NANCARROW.

The water in this mine is drained as low down as the 98, the bottom of the mine, from reports, being about 5 fathoms deeper. The 98 has not been opened to any great length, but the 90 and the upper levels have been driven a considerable distance, and the backs wrought extensively, and the bottom of the 90 so low down in places as could be reached for the water. Considerable quantities of ore yet remain standing in the backs of the different levels, which will pay well for taking away. The former proprietors took out the most productive part of the lode, so far as they opened; but the lode generally is very wide, and often in two or more parts, and in a great many places but one part worked, so that by driving short cross-cuts in different places much more ore will be discovered. I consider, in the present position of the mine, from 300 tons to 350 tons of copper ore may be raised per month, of rather low quality; and a great deal must depend on the standard as to the quantity that may be raised at a profit to the mine, there being great quantities that will pay well at a high standard, which will not leave a profit for working at a low standard. I would strongly recommend that you, with as little delay as possible, commence tutwork operations, so as to sink the mine and get levels under the ore ground left going down by the former company in bottom of the different levels; also to drive such cross-cuts as may be required for the further development of the lode in the levels already driven. The part of the mine most productive in depth appears to be east and west of the engine-shaft, and I would strongly urge the clearing up the shaft with as little delay as possible, and to commence sinking below the present bottom. Fielding and Offord's shafts should also be sunk without delay, in order to get up the stuff from the 98 end, in the bottom levels, besides which the present levels should also be extended both east and west. The ends were left by the former adventurers, as might be expected, poor; but the lode throughout the mine is very wide, and there is yet a fair chance of discovering large deposits of ore at the present depth. The former workers appear to have sunk in different places in the bottom of the 90 fm. level, as far as they could get down for the water, on the best bunches of ore. This ore ground, in order to leave its full profit to the adventurers, must be drained from deeper levels; if worked underhand in the water, as formerly, little or no profit will be the result. I would also suggest for your consideration the propriety of fixing a price on the drawing and the dressing of both tin and copper ores to be paid by the tributers, such price to be about the actual cost to the mine; it could then be seen at once what will pay or otherwise. And I would also recommend that you have all tinstuff weighed and sampled by the ton, and a regular tin stock account kept; had such been the case up to the present time, I am of opinion that the results from the stamps would have been more satisfactory. In the drawing department great improvement may be made by fixing guides and skips in the principal drawing shafts, by which means much greater quantities of stuff may be raised from the mine with less expense. The water from this mine contains a great quantity of acid, which is very prejudicial to the boilers and condensing work of the engines, and will, if not remedied, entail a great and continued expense and loss of time while repairs are being effected. The former proprietors drove a level through the hill behind the engine, for the purpose of bringing in water from the adjoining valley; the level still exists, but the valley has been drained by an adit level and it will now be necessary for the present company to erect a small engine for the express purpose of lifting water for condensing purposes; a full supply of good water can be had from Wheal Daniell, a shaft in the eastern part of your sett, where I would recommend your erecting a small engine for the purpose. In conclusion, I would remark that you are in course of draining what will, to all appearance, if worked with energy, perseverance, economy, and good management, become a lasting and remunerative mine. —R. S. BRYANT.

Mr. LANYON stated he had heard these reports, but thought they differed from Capt. Pascoe's. He still had the utmost confidence in the manager; he had performed a great undertaking, which was stated could not be done for 250,000*l.*; and though he had made one or two errors, those were matters that would not occur in future; he would, therefore, propose a vote of confidence in Capt. Pascoe.

Mr. KING, feeling in duty bound to oppose this resolution, requested the Chairman and meeting to give him an attentive hearing. He came down to represent the London committee, and his own friends, and, however painful might be his position, he had a duty, and that duty he would perform; and though he had to stand at this meeting amongst upwards of 50 local adventurers, it seemed to him he was standing alone. First, the reports of the agents called in all agreed as to the value of this great mining property, but the mine had been in fork to the 80 six months, and not 50*l.* had been spent in tutwork operations; not one single end in the mine had been driven; was it possible this great concern could be carried on without new discoveries were made? was it likely the late company would leave rich courses of ore in sight? No; though an immense quantity of low per centage ore could be raised at a good standard, without new discoveries you would never receive dividends. He would now read the minutes of a special meeting of the committee, held on the Saturday previous to his coming to this meeting—

"Mr. King having received a libellous communication, signed by 'W. James,' of Chacewater, he had brought the same before the committee, when it was resolved that on Mr. King's arrival in Cornwall he investigate the matter.—It was further resolved—'That the committee being of opinion that the management of the mine is not conducted in a satisfactory manner, strongly recommend that Capt. Pascoe be at once removed from his office.'"

(Mr. KING) had investigated the matter, and traced it to the residence of the manager, and could place the most incontestible proofs before this meeting that the same emanated from Capt. Pascoe, and would ask, is this man worthy of their confidence? Mr. LANYON said I regret to say I must withdraw my resolution, and I do so with great pain.

Mr. WILLIAM HARVEY said: Mr. Chairman, I have now a few words to say previous to proposing a resolution. At the commencement of this mine we were led to take a much larger interest than we intended, as we had the utmost confidence in Captain Pascoe, and he has had that confidence until within the last six weeks, but several matters have come before us lately which we considered to be against the interest of the adventurers. I shall, therefore, now propose that this meeting withdraw its confidence in Captain Pascoe.—Which resolution was seconded and carried without one dissentient.

Capt. PASCOE tendered his resignation, which was accepted.

A resolution was then passed, appointing Captain John Nancarrow agent, *pro tem*, and that he at once take charge of the property.

A vote of thanks was given to Mr. Pike, the Chairman.

Mr. PIKE, in returning his acknowledgments, stated that he came to the meeting determined to give the manager every support, but he was quite unprepared for what had taken place. He deeply regretted that Capt. Pascoe should forfeit the confidence of this meeting: he had placed himself in a most unenviable position.

The meeting then terminated. The adventurers present, and by proxy, amounted to nearly 5000 out of 6000 shares.

## CORNISH MINE PHOTOGRAPHS—No. XXVII.

"MINING, AND UNDERMINING."

The next to universal complaint against mining in this and every other country is that the practice thereof is not generally pursued for legitimate purposes of the profession, or as mining should be: that these means bring it into disrepute, disfavour, and contempt, we are far from denying; indeed, from painful experience we know it to be so in many, sadly too many, instances; but we repudiate such practices as appertaining to "legitimate mining." Could but a tithe of the faults, trickeries, and mismanagement attributed to mining be fairly attached to it, we should for ever abjure the science, and blush for its professors; aye, and so blush that were we even a collier or a Cairne Kye man the glow of conscious guilt would be perceived beneath the grime on our cheek. We would not hesitate to advise all who call themselves miners to take up their traps and walk, to let merry England and her virtuous sons alone in their glory to work their own riches, and see if they, then, would find fault with each other—to let miners migrate to other more favourable scenes for their labours. But, as we know the arrows of calumny fall harmlessly at the feet of truth, we remain in full confidence of their cause, and of its ultimate triumphant success over the foul stigma under which it has long laboured; and we trust, by our showing that undermining has long been represented and mistaken for mining, we shall be doing them and the public equal service—the former by doing them justice, and the latter by explaining the difference between the shadow and the substance, which at first sight it must be owned are so much alike as to be mistaken the one for the other.

Mining, as laid down in our English dictionaries, means the art and science of procuring metals and minerals from the bowels of the earth. Mining, as represented in common parlance, is too frequently understood as a system of barefaced robbery—a delusion, and a snare. Now, either the one or the other must be a fallacy. To illustrate our subject, we must draw from nature; the effect (then (if correctly photographed) must be true, and we must see how they tell in our picture.

The subject of which we are now about to treat is—the fate of mining when unfortunately placed in improper and unprincipled hands, or is made use of for other than legitimate purposes. Our portrait will be known to many, as is our intention. A light set on a hill cannot be hid, and our mines shall not form an exception. Well, then, mining being the art of procuring metals and minerals from the bowels of the earth, who, pray, gentle reader, are the proper persons to be employed?—Propriety would answer, "Miners, of course!" Echo would reply, "Of course." In our instance, though miners long proclaimed that minerals and metals abounded, miners were not allowed to work the mine—that is to say, to manage and direct the operations. Parties wholly ignorant of the first principles, and totally incompetent to the task, took this, the main spring of success, on themselves; and, instead of applying the proceeds of such shares as were absolutely sold to the purposes of the mine, put the money into their own pockets, and declared that the shares disposed of were their own free shares, and not the company's; thus, out of thousands of pounds nominal capital, only a few scores were applied to develope the mine, and then in dribblets so spare that the miners, captains, and all were never paid regularly, but kept starving on from month to month, doing little or no work, being discouraged and disheartened ("No pay, no work" is the miners' maxim); until, at length, the strong arm of the law was called in, in shape of a sharp attorney, to compel payment (there are some of these gentry even in the mining districts, who fatten, too, in these apparently barren spots). This sharp practitioner was the "friend" of the poor miners in their distress: he kindly advanced them a trifle whenever they came to him with complaints of not being paid by the purser, and requested him to get their money (which occurred at almost every pay-day). He, as considerately as kindly, at once served such shareholders as could pay with sundry slips of parchment, entailing a cost of two guineas each, by way of forcibly informing them of the fact of the poor men's deprivations. Though scarcely more than 100*l.* per year was spent on the mine, this worthy scion of the law boasted it was worth to him 200*l.* per annum during the whole period of its working under this company. As might have been expected, these proceedings came to an end; but what an end!—This skilled practitioner having an action (not for wages), issued process against two shareholders who he thought could pay his fees and costs at least. These he and they allowed to accumulate until they amounted to something frightful. When he thought they had gone as far as he deemed prudent, he insisted on immediate settlement. They, to protect themselves from incarceration, hurry off to the fountain-head, and placed themselves under the ægis of that imposing offspring of man's reason—Chancery.

We wonder if the ancient poet had the head of a Lord Chancellor in view when he idealised the head of a Medusa—whether he really had so fertile a brain as to figure his flowing wig curls as snakes, and the effect of these and his awful countenance as electrifying and paralising everything their influence fell upon, and turning them into stone? We must not thus digress in episodes, though the fact be patent to all in the stony heart of the law and its myrmidons: when once under the shield they, simple men that they were, thought themselves safe; but no, that would not do, for law is law, and can no more be carried on without money than can mining; so that somebody pay the piper, paper, parchment, pens, ink, and stationery will be provided. But there are sundry fees, refreshers, and other etceteras in Chancery quite as expensive as steam-engines, not half so useful, but far more powerful, as their expansion and power cannot be computed. To work a Chancery suit entails far heavier expenses than to work a mine. The result has proved the fact that about 300*l.* was expended to work the mine, which was then finished off by the law process; and about 3000*l.* has been expended to work the suit. The mine has since been sold for more than the actual outlay thereon; and the adventurers have been "sold" at not one-half their deserts, for their folly. The mine has been perseveringly and judiciously wrought by the purchaser, has been found to be what the miners predicted, and proved to actually be of immense value; but, *credat Judæus!* at the sugestion of one crotchety proprietor—and one only—this unfortunate, though valuable, discovery is condemned again to undergo the fatal glance, and to be again paralised by the horrid head.

These foolish adventurers, like thousands else, attribute their losses to mining. Now, candid reader, let me appeal to you—Do you call these losses chargeable to mining, or to mismanagement? We say, let reason rule. It has been proved beyond doubt that had mining or miners been attended to, or consulted, the adventurers, in the first instance, would have reaped a rich prize, had they not entrusted their interests to unscrupulous, necessitous, and improper parties—had they followed the advice of those who understood the matter practically, and paid them regularly out of the funds which ought, in all fairness, to have been devoted to that end, and not have allowed themselves to be the victims of a sharp attorney; and had they not, in an evil hour, suffered themselves to have been ruined by one great false and fatal step. Yet, strange and mysterious as it may appear, with the sad example before them, the spell-bound party again rush with open eyes to feed and glut the insatiable maw of the monster, which antecedents should have taught them to avoid.

The picture is literally true, we grieve to say; it is the type of many: yet this is but a phase of the calumny under which mining so undeservedly labours. The injustice may yet be further illustrated in this very instance. There is not an individual connected with this sad affair but what will (if he go into the *Gazette* for the next 20 years) make mining the stalking horse and cause of his ruin. Though he has not expended 5*l.* in the adventure, he will never cease harping on the subject, and endeavouring to make the world believe he has been a martyr to the cause. The bitterness of his disappointment in allowing so great a prize to slip between his fingers is a source of deep and continual reflection: the wealth that was within an ace of being his haunts his mind. Had such parties but common sense they would, like many others, not only alter, but have good reason to alter, the burden of their tale; and, instead of gloomily condemning the shadow, look by the light of reason at the substance. In place of casting obloquy on mining and its professors, hold them up, as they ought to be—the fountains of wealth, the sources of comfort, and the mainsprings of our national wealth.—GEORGE HENWOOD.

## DARTMOOR—No. III.

Dartmoor was originally a far more extensive tract of land than is comprised within its present boundary; formerly embracing in its limits the surrounding commons, diverging from the centre of the moor to the cardinal points. There have been various perambulations since the Norman conquest to define its bounds. In a work before us, the writer states that in the 24th year of the reign of Henry III. a perambulation was ordered by Richard, Earl of Cornwall: on the back of a copy of this document, amongst the Harleian papers, is a circular tracing of the forest, the middle part being intituled "This is the precincte about the Foreste of Dartmoor;" and another circular line being drawn outside, for the surrounding commons, which included "Ayshborn, Roborough, Plympton, Tavistoke, and Okehampton."

In a report made in 1621, mention is made of *venville estates*, which were a portion of the ancient Duchy possessions. The *venville* parishes are—Sheepstor, Walkhampton, Samford Spiney, Samford Courtenay, Whitchurch, Peter Tavy, Mary Tavy, Meavy in part, Cudlipps Town in Tavistock, Taverton Sithing, Shaugh Prior, Dean Prior, Widdicombe Manaton, North Bovey, Chagford, South Tawton, Gidleigh, Thrawleigh, Sourton, Bridestow, Belstone, Holne, Buckfastleigh in part, Lamerton, Lydford, Okehampton, South Brent, Ugborough, Cornwood, and Harford.

The chief object in drawing attention to Dartmoor is to point out its numerous resources: and as we did not intend to confine our remarks to what is termed the Moor, according to its present limitations, but to carry our researches to the original Dartmoor, where we shall find its purlieus abound in copper and all other minerals, not to the exclusion even of the precious metals.

A correspondent, in the Journal of Jan. 30, observes that "having traversed over this vast tract on several occasions," he had "not heard of or seen, but on one occasion, copper in Dartmoor." We will endeavour to show that mines within the granitic influence of Dartmoor, which have been worked to any extent for copper, have proved productive; and that it only requires enterprise and capital to more fully develope the vast resources of this great mineralised district to render it the *Gwennap* of Devon. Scarce one of the above-named parishes but has its copper mine, and those that have been worked to any depth have resulted in great remuneration to its adventurers. Indeed, we look upon Great Wheal Friendship, in Mary Tavy, as the longest continuous dividend-paying mine on record; and also upon Devon Great Consols, in the parish of Tavistock, as the richest and most productive mine ever known, although we did not intend to bring the latter within the precincts of Dartmoor; but we shall claim Wheal Friendship as a favoured offspring of the Moor.

Tin is the staple mineral found within the granite range of Dartmoor, still as but few mines have been worked to any depth no man can state that copper even may not be found in deeper levels, carrying tin on the backs of the lodes. We need not go far to prove by ample testimony this fact, and many experienced miners entertain the opinion, that if shafts were sunk to any reasonable depth copper would probably be met with. We do not wish to start improbabilities, to rouse a spirit of disputation upon a matter which can only be proved by experience, capital, and enterprise: but this we do believe, that a richer field for the employment of capital in the search of *tin* is not to be found in any similar extent of country in the British empire.

On the skirts of the Moor copper lodes are numerous and well known,

# STATISTICS OF THE MINING INTEREST.

BY WILLIAM HENRY CUELL, ESQ.

## TABULAR STATEMENTS, WITH RETURNS OF METAL, ON DIVIDEND-PAYING MINES, FOR THE PAST YEAR (1857).

### CORNISH AND DEVONSHIRE MINES.

| No. of Shares | Name of Mine. | Amount Paid. | Market Price. | Dividend per share. | Total Amount | Metal. | Parish. | Purser or Sec. | Address. | System. | Dividend payable. | Copper. | Tin. | Lead. | Total Amount of Money. | Lease granted. | Dues. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | £ s. d. | £. | £ s. d. | £. | | | | | | | Tons. | Tons. | Tons. | £. s. d. | In Years. | |
| 5120 | Alfred Consols | 2 11 10 | 13 | 2 9 0 | 12544 | Copper | Phillack | H. Noell | Hayle | Cost-book | Two months | 4505 | — | — | 32,894 0 0 | 1850 ...... 21 | 1-18 & 1-20 |
| 4000 | Bedford United | 2 6 8 | 7¾ | 1 3 6 | 4700 | Copper | Tavistock | G. Kieckhoefer | 50, Threadneedle-street | ditto | Three months | 2546 | — | — | 15,724 0 0 | 1841 ...... 21 | 1-15 |
| 240 | Boscean | 20 10 0 | 80 | 9 0 0 | 2160 | Tin | St. Just | S. York | Penzance | ditto | Two months | — | — | — | | | |
| 200 | Botallack | 91 5 0 | 202½ | 33 0 0 | 6600 | Copper and tin | St. Just | S. H. James | St. Just | ditto | — | 979 | 184 | — | 25,735 0 0 | | 1-24 & 1-18 |
| 420 | Budnick Consols | 2 2 6 | 6 | 0 10 0 | 210 | Tin | Perran | J. Borrow | Truro | ditto | — | — | — | — | | | |
| 4096 | Calstock Consols | 5 0 0 | 5¾ | 0 2 6 | 512 | Copper | Calstock | H. E. Croker | Falmouth | ditto | — | 173 | — | — | 1,128 0 0 | | 1-15 |
| 1000 | Carn Brea | 15 0 0 | 55 | 6 0 0 | 6000 | Copper and tin | Redruth | F. Rochfort | Queen-street-place | ditto | — | 3547 | 460 | — | 45,280 0 0 | | 1-19 |
| 2000 | Collacombe | 5 0 0 | 15 | 2 5 0 | 4500 | Copper | Lamerton | W. A. Buckley | Threadneedle-street | ditto | — | 1560 | — | — | 10,340 0 0 | ...... 21 | 1-15 |
| 256 | Condurrow, *a* | 20 0 0 | 90 | 10 0 0 | 2560 | Copper and tin | Camborne | N. Vivian | Camborne | ditto | — | 1578 | 119 | — | 18,887 0 0 | 1845 ...... 21 | 1-20 |
| 1055 | Craddock Moor | 8 0 0 | 40 | 0 12 0 | 632 | Copper | St. Cleer | E. A. Crouch | Liskeard | ditto | — | 994 | — | — | 9,982 0 0 | | |
| 1024 | Devon Great Cons., *b* | 1 0 0 | 470 | 67 0 0 | 68608 | Copper | Tavistock | A. Allen | Gresham House | Joint-stock | Two months | 25746 | — | — | 146,517 6 0 | 1844 ...... 21 | 1-12 |
| 672 | Ding Dong | 32 0 0 | 20 | 1 0 0 | 672 | Tin | Gulval | Bolitho and Co. | Penzance | Cost-book | Three months | | — | — | | | |
| 179 | Dolcoath, *c* | 257 15 6 | 800 | 36 0 0 | 6444 | Copper and tin | Camborne | C. Thomas | Camborne | ditto | Two months | 518 | 554 | — | 45,031 0 0 | | |
| 12800 | Drake Walls | 1 19 0 | 2½ | 0 4 6 | 2880 | Tin | Calstock | H. Williams | Moorgate-street | ditto | — | | 253 | — | 19,407 0 0 | | |
| 280 | Derwent Mines | — | 150 | 10 0 0 | 2800 | Silver-lead | Durham | B. O'Connor | Queen-street-place | ditto | — | | — | — | | | |
| 2048 | East Falmouth | 2 0 0 | 4 | 0 5 0 | 512 | Lead | Falmouth | C. Wescomb | Exeter | ditto | — | | — | — | | | |
| 128 | East Pool, *d* | 24 5 0 | 150 | 30 0 0 | 3840 | Copper and tin | Pool | W. Prisk | Illogan | ditto | Two months | 2572 | 47 | — | 16,793 0 0 | | |
| 5700 | Exmouth and Adams | 4 15 0 | 8 | 0 15 0 | 4275 | Lead | Christow | J. G. Bidwell | Exeter | ditto | ditto | | — | 1287 | 18,576 0 0 | | 1-30 |
| 1100 | Eyam | 5 0 0 | 6 | 0 10 0 | 550 | Lead | Derbyshire | Maltby | Eyam | ditto | — | | — | — | | | |
| 4940 | Fowey Consols | 4 0 0 | 5 | 0 6 0 | 1482 | Copper | Tywardreath | Capt. Davis, R.M. | St. Blazey, Cornwall | ditto | Three months | 5461 | — | — | 39,060 0 0 | | |
| 243 | Gramb. & St. Aubyn, *e* | 109 10 0 | 80 | 6 0 0 | 1458 | Copper | Gwennap | W. Richards | Redruth | ditto | — | 307 | — | — | 7,257 0 0 | | 1-18 |
| 6000 | Great South Tolgus | 2 10 6 | 16 | 1 7 0 | 8100 | Copper | Illogan | W. A. Buckley | 50, Threadneedle-street | ditto | — | 2994 | — | — | 20,878 0 0 | ...... 21 | |
| 119 | Great Work | 100 0 0 | 140 | 15 0 0 | 1785 | Tin | Breage | J. Clarke | Helston | ditto | Three months | | 178 | — | 15,047 0 0 | 1846 ...... 21 | 1-28 |
| 1024 | Herodsfoot | 8 10 0 | 7 | 0 10 0 | 512 | Lead | Liskeard | T. Mitchell | 13, George-yard | ditto | Four months | | — | 513 | 8,488 0 0 | | |
| 160 | Levant | 2 10 0 | 80 | 8 0 0 | 1280 | Copper and tin | St. Just | H. Borrow | Truro | ditto | Three months | 1687 | 181 | — | 21,637 0 0 | | 1-24 & 1-20 |
| 5000 | Mendip Hills | 3 15 0 | 1¾ | 0 5 0 | 1250 | Lead | Blagdon | E. H. Barwell | Bristol | ditto | — | | — | — | | | |
| 6000 | North Wh. Basset, *f* | — | 12 | 2 11 0 | 15300 | Copper and tin | Illogan | J. Pascoe | 50, Threadneedle-street | ditto | Two months | 3985 | — | — | 35,720 0 0 | | 1-15 |
| 6400 | Par Consols | 1 2 6 | 21¾ | 4 6 0 | 27520 | Copper | St. Blazey | Capt. Davis, R.M. | St. Blazey | ditto | Three months | 4173 | — | — | 43,643 0 0 | | |
| 200 | Phoenix | 100 0 0 | — | 40 0 0 | 8000 | Copper and tin | Linkinghorne | T. Cross | Cornwall | ditto | ditto | 5170 | — | — | 30,002 0 0 | | |
| 1000 | Polberro (Pref.) | 15 0 0 | — | 4 0 0 | 4000 | Tin | St. Agnes | Com. of Manage. | 6, Queen-street-place | ditto | ditto | | {256 | — | 19,124 0 0 | | |
| 1772 | ditto (old and do.) | — | — | 0 10 0 | 886 | Tin | St. Agnes | ditto | ditto | ditto | ditto | | | | | | |
| 560 | Providence | 20 13 0 | 82½ | 18 0 0 | 10080 | Tin | Uny Lelant | S. Higgs | St. Ive | ditto | ditto | | 295 | — | 22,695 0 0 | | |
| 512 | Rosewarne, *g* | 12 0 0 | 25 | 3 10 0 | 1792 | Copper and tin | Gwinear | W. Huthnance | Cornwall | ditto | Two months | 1558 | — | — | 11,968 0 0 | 1852 ...... | |
| 896 | Sortridge Consols | 12 0 0 | 1¾ | 1 10 0 | 1344 | Copper | Whitchurch | V. Cohen | Bank-buildings | ditto | Three months | 923 | — | — | 6,694 0 0 | | |
| 256 | South Caradon | 2 10 0 | 360 | 56 0 0 | 14336 | Copper | St. Cleer | T. Kitto | Liskeard | ditto | Two months | 4538 | — | — | 46,894 0 0 | | 1-18 |
| 256 | South Tolgus | 16 0 0 | 155 | 11 0 0 | 2816 | Copper | Redruth | J. Taylor and Sons. | 6, Queen-street-place | ditto | — | 2004 | — | — | 18,048 0 0 | | |
| 496 | South Frances | 18 18 0 | 255 | 52 0 0 | 25792 | Copper and tin | Illogan | J. Cady | Cornwall | ditto | Two months | 5773 | 14 | — | 43,483 0 0 | 1844 ...... 21 | 1-15 |
| 20000 | St. Day United | 2 0 0 | 1¾ | 0 2 6 | 2500 | Copper | Redruth | F. Pryor | Cornwall | ditto | — | 1362 | — | — | 8,640 0 0 | | |
| 94 | St. Ive Consols | 80 0 0 | 150 | 12 0 0 | 1128 | Tin and copper | St. Ive | J. Vivian | Penzance | ditto | Four months | 7 | 213 | — | 14,649 0 0 | 1846 ...... 21 | 1-18 |
| 6000 | Tincroft, *h* | 9 0 0 | 4 | 0 10 0 | 3000 | Tin | Illogan | H. Williams | Moorgate-street | ditto | Three months | 2243 | 168 | — | 22,658 0 0 | | |
| 4096 | Trewetha | 2 0 0 | 1¾ | 0 3 0 | 614 | Lead | Menheniot | W. T. Dunsford | Threadneedle-street | ditto | ditto | | — | 339 | 7,909 0 0 | | 1-30 |
| 512 | Wendron Consols | 23 10 0 | 34¾ | 2 0 0 | 1024 | Tin | Wendron | F. Hill | Helston | ditto | — | | — | — | | | |
| 6000 | West Basset, *i* | 2 10 0 | 27½ | 3 10 6 | 21150 | Tin | Camborne | J. Pascoe | 50, Threadneedle-street | ditto | Two months | 7068 | — | — | 46,595 0 0 | 1855 ...... 21 | |
| 256 | West Caradon | 13 0 0 | 110 | 13 0 0 | 3328 | Copper | St. Cleer | E. A. Crouch | Liskeard | ditto | — | 4207 | — | — | 32,593 0 0 | 1854 ...... 21 | 1-15 |
| 256 | West Damsel | 10 7 0 | 80 | 6 0 0 | 1536 | Copper | Gwennap | G. A. Mitchell | Redruth | ditto | Two months | 2005 | — | — | 11,776 0 0 | 1851 ...... 21 | 1-18 |
| 1024 | West Providence | 5 0 0 | 11 | 1 0 0 | 1024 | Copper and tin | St. Erth | R. R. Michell | Marazion | ditto | Three months | | — | — | | 1841 ...... 21 | 1-18 |
| 400 | West Wheal Seton | 38 10 0 | 300 | 46 0 0 | 18400 | Copper | Camborne | T. H. Tilley | Falmouth | ditto | Two months | 4851 | — | — | 36,296 0 0 | | 1-15 |
| 512 | Wheal Basset | 5 3 6 | 250 | 41 0 0 | 20992 | Copper and tin | Illogan | W. Richards | Redruth | ditto | ditto | 5721 | 38 | — | 46,729 0 0 | 1849 ...... 21 | 1-15 |
| 256 | Wheal Buller, *j* | 5 0 0 | 300 | 41 0 0 | 10496 | Copper and tin | Redruth | S. and R. Davy | Redruth | ditto | ditto | 6494 | — | — | 34,507 0 0 | 1849 ...... 21 | 1-16 |
| 250 | Wheal Clifford | — | 200 | 17 0 0 | 4250 | Copper | Gwennap | Williams and Son. | Scorrier House, Truro | ditto | Four months | 3234 | — | — | 19,661 0 0 | | 1-15 |
| 1024 | Wheal Gryllis | 0 4 0 | ⅜ | 0 2 0 | 102 | Copper and tin | Breage | R. R. Michell | Marazion | ditto | — | | — | — | | | |
| 512 | Wheal Jane, *k* | 3 10 0 | 17s. | 4 0 0 | 2048 | Copper and tin | Kea | J. Tippet | Truro | ditto | — | 151 | 9 | — | 7,129 0 0 | 1851 ...... | 1-18 |
| 5000 | Wheal Kitty (St. Ag.) | 4 10 0 | 4½ | 0 5 0 | 1250 | Tin | St. Agnes | E. King | Austinfriars | ditto | — | | 174 | — | 11,965 0 0 | | |
| 1024 | Wheal Kitty (Uny Le) | 1 7 2 | 11¾ | 2 15 0 | 2816 | Tin | Uny Lelant | T. Richards | Lelant | ditto | Three months | | 153 | — | 11,417 0 0 | | 1-20 |
| 448 | Wheal Margaret | 19 15 0 | 45 | 15 0 0 | 6720 | Tin | Uny Lelant | T. Treweeke | St. Ive | ditto | ditto | | — | — | | | 1-24 |
| 1024 | Wheal Mary Ann | 8 15 0 | 44 | 8 15 0 | 8960 | Lead | Menheniot | P. Clymo, jun. | Liskeard | ditto | ditto | | — | 1597 | 35,864 0 0 | 1839 ...... 21 | 1-15 |
| 80 | Wheal Owles | 25 0 0 | 300 | 23 0 0 | 1840 | Tin | St. Just | J. Boyns | St. Just | ditto | ditto | | 247 | — | 20,426 0 0 | | 1-25 |
| 198 | Wheal Seton | 107 0 0 | 150 | 12 10 0 | 2475 | Copper | Camborne | Capt. S. Reeves | Cornwall | ditto | Two months | 2527 | — | — | 14,497 0 0 | | 1-15 |
| 1040 | Wheal Trelawny | 5 10 0 | 25 | 2 15 0 | 2860 | Silver-lead | Liskeard | J. Bryant | Cornwall | ditto | Three months | | — | 1285 | 27,647 0 0 | | |
| 4096 | Wheal Wrey | 1 10 0 | 5 | 0 9 6 | 1946 | Lead | St. Ive | P. Clymo, jun. | Liskeard | ditto | ditto | | — | 837 | 15,032 0 0 | | |

### WELSH.

| No. of Shares | Name of Mine. | Amount Paid. | Market Price. | Dividend per share. | Total Amount | Metal. | Parish. | Purser or Sec. | Address. | System. | Dividend payable. | Copper. | Tin. | Lead. | Total Amount of Money. | Lease granted. | Dues. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 128 | Cwmystwith | 60 0 0 | 180 | 25 0 0 | 3200 | Lead | Cardigan | J. Taylor & Sons. | Queen-street-place | Cost-book | Three months | — | — | 1131 | 17,313 0 0 | | |
| 300 | East Daren | 32 0 0 | 100 | 18 0 0 | 5400 | Copper and lead | Cardigan | J. Taylor & Sons. | Queen-street-place | ditto | ditto | 28 | — | 947 | 16,887 0 0 | | |
| 400 | Lisburne, *l* | 18 15 0 | 120 | 18 0 0 | 7200 | Lead | Cardigan | J. Taylor & Sons. | Queen-street-place | ditto | ditto | — | — | 2191 | 34,723 0 0 | | |
| 20000 | Rhoswydol & Bach. | 11 5 0 | 12 | 0 6 | 750 | Lead | Machynlleth | G. Madley | Old Jewry | ditto | | — | — | 392 | 5,718 0 0 | | |
| | Vale of Towy | 0 12 6 | 1¾ | 0 0 6 | 500 | Lead | Carmarthen | T. Field, jun. | Crown-court, Thread.-st. | ditto | ditto | — | — | 661 | 8,682 0 0 | | 1-12 |

*a.* Includes 24*l.* for arsenic. *b.* 6113*l.* for carriage. *c.* 267*l.* for arsenic. *d.* 167*l.* for tinstuff. *e.* 550*l.* for tinstuff. *f.* 2562*l.* for tin.
*g.* Includes 84*l.* for mundic, &c. *h.* 132*l.* for arsenic. *i.* 884*l.* for tin. *j.* 425*l.* for tinstuff. *k.* 5853*l.* for mundic, tinstuff, &c. *l.* 290*l.* for blende.

*** The returns in the foregoing Table are made up to the end of the year, at which time the quotations were current, and the much other information correct. The publication of the Table has been unavoidably postponed, but is now inserted, as containing useful matter for reference.

although but few have been worked remuneratively, arising from the want of capital, perseverance, or other circumstances which too frequently intervene, and preclude a valuable mine from being fairly developed. Yet we trust the period is not far distant when its valleys will send forth the sounds of active industry, rendering manifest that legitimate mining is a laudable undertaking, and worthy the notice of an enlightened public.

We have heard the music of a dozen or more riveters' hammers clinching the huge iron plates used in the construction of a steam-boiler echoing from hill to hill; and to our ear and taste we consider the melody far more grateful, and in better harmony with the interests of a great commercial country, than the clamourous shrieks and halloos of fifty "tally ho's."

Lead has been found in many places; but as we purpose giving the several mines which have been worked, and in course of working, for the different minerals, we shall leave the particulars for another opportunity.

Iron veins are abundant in different parts of the Moor: and it is on record that the Romans worked extensively for that metal.

Gold has been met with in the several rivers and various stream works, and in the Plym especially. A miner of the name of Wellington, about 35 years since, discovered and sold at Plymouth several ounces, realising nearly 40*l.* at one time.

Silver is richly combined with the lead. In the reign of Edward III. abundance of silver was raised in Devon, and some coined into money.

Cobalt, antimony, manganese, &c., are also met with in the purlieus of the Moor; but the latter has been worked most extensively and profitably for a great number of years, especially by Messrs. Williams, of Scorrier, as well as many other private companies.

Since we published the last paper, we have received from Mr. John Philp, of Liskeard, the worthy purser of Trelawny Mine, an impression of an ancient seal of the Duchy, which was discovered by his late father among some old metal about 34 years since, and by him sold to the late Mr. Benjamin Hart Lyne, solicitor of that town, who presented it to the Duchy Office in London. The seal is of brass, and in a high state of preservation, bearing the arms of England and France, but with no date: and is supposed to have been the official seal of the Duchy at the period when Henry, the eldest son of Henry IV. (who afterwards succeeded to the throne as Henry V.) was Duke of Cornwall.

## ALLIANCE BANK.

The annual meeting of proprietors was held at the London Tavern, Bishopsgate, on Wednesday, Mr. William Miller, in the chair.

The Chairman said, the present meeting was of a concern in which he had taken a considerable interest, and at the time it was instituted he joined it with a view of permanent investment. It was unnecessary for him to conceal that they had been attacked by invidious reports from without, but he was pleased to find those reports were based upon nothing, and he had too much experience in business to lend a willing ear to such statements. As he (the Chairman) had not attended the meetings he could not give a very full account of their affairs, but as they were not met to deal with opinions, but with facts, he would call upon Mr. Stokes to lay before them a statement of the business of the bank.

Mr. Stokes then read the following report:—

The annual meeting of the shareholders of the Alliance Bank is fixed by the by-laws, to be held in Paris in the month of March; it had been accordingly summoned for the first of that month, being the earliest day possible, but in consequence of the non-deposit of a sufficient number of shares to make the meeting valid it was adjourned to Monday, the 29th inst., on which day the formal report and accounts will be presented, and the dividend declared. In the meantime, as has hitherto been the custom, the shareholders resident in this country have been requested to meet in London, by advertisement in the *Times*, and by circular letter, in order that they may be made acquainted with the results of the bank's operations during the past year.

At the last meeting held in London, on September 24, 1857, the shareholders were reminded that the balance carried forward on Dec. 31, 1856, to profit and loss new account, had been 158,299 frs 21 c.=6331*l.* 19*s.* 5*d.* The gross profits of the year 1857 have been 961,529 frs. 10 c.=38,461*l.* 3*s.* 2*d.*, from which must be deducted the current expenses, amounting to 160,221 frs. 41 c.=6408*l.* 17*s.* 1*d.*, and the amount written off for bad debts previous to Dec. 31, 1857—40,584 frs. 53 c.=1623*l.* 7*s.* 7*d.*: leaving a profit for the year 1857 of 760,723 frs. 16 c.=30,428*l.* 18*s.* 6*d.* Out of this sum a dividend of interest at the rate of 5 per cent. per annum, for the half-year ending June 30 last, was declared in September, this being 12½ frs., or 10*s.* per share on 10,000 shares, amounted to 125,000 frs.=5000*l.*, leaving a balance of profits of 635,723 frs. 16 c.= 25,428*l.* 18*s.* 6*d.* But since that date (Dec. 31, 1857), in consequence of two failures of which the result is uncertain, it has been thought best to write off provisionally the whole amount due from the parties in question—54,541 frs. 60 c.=2181*l.* 13*s.* 3*d.*, with the expectation, however, that some assets will be ultimately recovered.

After the severe crisis that the commercial world has lately gone through, and considering the large amount of business done by the bank as a new undertaking, it cannot be a subject of surprise that some of the assets consist of securities, which though held as valuable are not immediately convertible into cash. It is, however, a matter of satisfaction to know that the actual amount of these securities is less than the amount of the nett profits for the year; nevertheless, upon the principle that it is right only to divide as profits the surplus actually available; the members of the council having in view the personal responsibility imposed upon them by the French law, as quoted to the shareholders in the first report of the bank, have determined to reserve the full amount of the securities referred to, thus reducing the dividend for 1857 to the rate of 5 per cent. per annum, leaving to the next meeting the division, by way of bonus, of such further profits as shall then be available. The payment of the above-mentioned dividend will take 125,000 frs.=5000*l.*; and after paying to the council and management their stipulated allowance of 5 per cent. each on divided profits, and placing the statutory 5 per cent. to the reserve fund, which sums together amount to 37,500 frs.=1500*l.* there will remain, in addition to the previous reserve of 6331*l.* 19*s.* 5*d.*, a further sum of 418,681 frs. 56 c.=16,747*l.* 5*s.* 3*d.* to be carried to the profit and loss new account. The dividend to be declared on the 29th inst. in Paris will be free from the new French tax called "Droit de Mutation," the whole of the bank pays, and includes in current expenses.

Mr. Stokes, in reply to questions, said the business done the first six months of last year was at the rate of 8,000,000*l.* sterling per annum, which was more than double the amount done the last six months, as the business had been greatly diminished, in consequence of its being necessary to exercise very great caution; and when credit was so very doubtful, it was considered better to check business than run any great risk. There was another point to which he (Mr. Stokes) would refer; it was considered desirable to get the shares quoted in the Stock Exchange List, and a memorial to that effect was presented to the committee, but the objection raised was that it was a French company, and not on the Paris Exchange; although that course was not adopted with the London General Omnibus Company, as they were quoted on the London Stock Exchange before they were on the official list in Paris. However, their shares were now quoted in Paris; and, according to a letter received from the committee of the Stock Exchange, he did not anticipate they would meet any further difficulty in having the shares quoted, as they had promised to take the matter into consideration after the present meeting.

The Chairman wished to know if any proprietor was desirous of asking any questions of Mr. Stokes?

Mr. Stokes, in reply to questions, stated, that from a determination to be on the safe side every security not actually realised was written off. (Cheers.) It was far better that they should have 10*s.* per share upon the present occasion than 30*s.*, and perhaps wait six months without a dividend. (Hear.) The dividend declared was legitimately from the profits, and there was no doubt that many of the amounts written off would prove good.

A Proprietor wished to know whether the whole of the shares were issued?

Mr. Stokes replied in the affirmative. There were two or three gentlemen in the room who had taken up the whole of the forfeited shares, and paid them up in full.

Mr. Cook enquired what the nett profits were for the half-year?

Mr. Stokes said, as the accounts were made up annually, it was rather a difficult question to answer, but in round numbers he might say from 8000*l.* to 9000*l.*; as the first six months the profit was about 16,800*l.*, and the total amount for the twelve months was 25,000*l.*

A Proprietor enquired what amount the dividend of 5 per cent. would consume?

Mr. Stokes said 10,000*l.*

The Chairman said he must be allowed to observe, that when he was called upon to fill the chair he came as one of them to receive information, and the effect left upon his mind by the statement of Mr. Stokes was very favourable. He would much rather see the council acting on the safe side than running any risk; and he thought he might congratulate them that they had gone through the late crisis not only prosperous but flourishing. He did not see how they could be excluded much longer from the Stock Exchange List. He hoped they would agree with him that Mr. Stokes had conducted the affairs of the bank to the satisfaction of every proprietor, and that the best thanks of the meeting be accorded to him for the extraordinary zeal and ability he had displayed in managing their business. (Hear.)

A vote of thanks to Mr. Stokes and the executive was then carried with applause.

Mr. Stokes, in acknowledging the compliment, felt highly gratified with the favourable expression of the meeting towards him, but he must remind them they were deeply indebted to the council, as he considered it was by their constant care, zeal, and indefatigable attention they had passed through the late crisis; and he would also remind the meeting that the gentlemen forming the council were large shareholders themselves, and gave their time, talents, and energy for the success of all.

A vote of thanks to the Chairman terminated the proceedings, which appeared to give great satisfaction to all present.

Divisibility of the Electric Light.—An interesting communication from M. Jobard appears in the *Progress International* relative to a discovery made by M. de Changy, whereby he is enabled entirely to overcome the difficulty hitherto experienced with regard to the divisibility of the galvanic current. His apparatus consists of a Bunsen pile of 12 elements, with some improvements of his own, which produces a constant luminous arch, free from intermittance and crepitation, between two carbon points, kept in position by a regulator, also invented by him, and certainly the most perfect which he (M. Jobard) has seen. To illustrate the effect of his invention he employs a dozen small miners' lamps, so arranged that at pleasure either one or the whole may be lighted up or extinguished at pleasure, and that, too, without increasing or diminishing the intensity of the light in the lamps remaining alight. The lamps are contained in hermetically closed glass tubes, and are specially intended for use in mines where there is a dangerous amount of fire-damp. The light is said to be extremely white and pure.

Separating Osmium-Iridium from Gold.—This metal is more dense than gold. The method adopted for its separation (at the St. Petersburg Mint) from Russian gold is to alloy it with three parts of silver, melt the metal in large black-lead crucibles, and keep them at rest for some time, during which the iridium granules sink to the bottom. The upper portion of the gold is then dipped out to within an inch of the bottom of the crucible, and run into ingots. The remaining portion of the metal left at the bottom contains the greater portion of the iridium, which is separated in the "wet way," by nitro-hydrochloric acid, which dissolves the gold, but does not act on the iridium granules.—*Scientific American.*



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